

Climate change economics on a small island: new approaches for Tobago

For small islands like Tobago — that depend heavily on tourism driven by their natural ‘beauty’ — climate change poses a double-edged threat on supply and demand. Rising sea levels, increasing temperatures and more frequent and intense storms will damage the island’s natural assets, such as coral reefs and beaches. This could have a heavy impact on tourism, which will also be affected by climate policy in ‘source’ countries. But what exactly will that impact be? How much will it cost? And what can be done about it? Traditional economic analysis is ill-equipped to answer these questions because it offers static and highly uncertain models and assessments of damage and loss, rather than flexible response options that consider system dynamics. We urgently need to use and expand new forms of economic analysis to better support the difficult decisions that Caribbean policymakers face as a result of climate change.

Policy pointers

- **Tobago depends heavily on** tourism — more than half its population are employed providing tourism services.
- **Climate change threatens** the island’s tourism industry by degrading natural assets such as coral reefs and beaches, and by limiting visits through climate policy in source countries.
- **Traditional economic** assessment of how climate change will impact tourism in Tobago and other small islands is inexact, expensive and of limited use for directing policy.
- **Economic analysis must** better consider the systemic nature of climate change impacts (both biophysical and socioeconomic) and projected tourism demand.

Small but beautiful

When Christopher Columbus sighted Tobago in 1498, he named it ‘Bellaforma’, meaning ‘beautifully formed’. It may be a small island — only 26 miles long by 6 miles wide, with just 55,000 people living on it, and very much smaller than its sister island Trinidad — but Tobago boasts an impressive array of natural assets. These include extensive coral reefs and beaches as well as the tropical forest of the main ridge, which is arguably the world’s oldest forest reserve, established in 1764 to protect the important watershed it regulates. Considering its small size, the island is also very biodiverse, housing more than 200 species of bird and a vast array of marine life, including five species of turtle.

This rich natural environment is a significant asset to Tobago’s principal industry, tourism. It benefits every tourism business on the island, both directly

and indirectly. Tourism directly employs more than half of the island’s resident population who in turn support other local businesses. But Tobago’s natural environment is under threat from climate change. Exactly how climate change will impact Tobago’s environment and its tourism industry remains, to some extent, poorly understood.

The burning questions are what will the impact be, how much will it cost in economic terms, and what can policymakers do about it?

Climate change impacts

Despite the uncertainty associated with predicting climate change, we can expect to see some trends in the Caribbean that will inevitably affect the region’s tourism, including in Tobago.

Sea level rise and storm surges. Climate modellers predict that climate change will cause an increase

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in both average sea levels and the size of waves in stormy weather in the Caribbean. Evidence of coastal erosion and beach loss is already seen along the

coastline of Tobago and other islands in the Caribbean.

A recent study¹ assessing sea level rise, storm surge and erosion impacts in the Caribbean Community (CARICOM) shows major

potential impacts on tourism (see Table). These include damage to key infrastructure such as hotels, sea ports and airports that lie close to the coast. Sea level rise or storm surges could also submerge or erode the beaches that are a major natural asset for tourism, central to perceptions and the experience of a classic Caribbean holiday.

Warmer sea temperatures. Tobago's coral reefs are a major attraction for visiting tourists, supporting world class snorkelling and scuba diving. Reefs also protect Tobago's beaches from erosion by reducing the strength of waves on the island's coastline. Warmer seas are thought to be a significant factor in the incidence of coral 'bleaching'. Coral bleaching occurs when environmental factors — including warmer sea temperatures — adversely affect the algae that are an integral part of the coral, giving it its colour and allowing it to grow. In 2005, a major bleaching event affected the whole of the Caribbean. A subsequent survey of Tobago's reefs found that two thirds of the coral was bleached.² Bleaching makes reefs less attractive to tourists because of their loss of colour. It also threatens their long-term viability as reefs are eroded more quickly than the coral is replenished.³

Carbon 'awareness'. Tourists generally reach Tobago either through a limited number of direct international flights or through internal sea and air links with Trinidad. Growing awareness of the carbon impact of long-haul flights combined with climate policy in source countries and environmental taxes on aviation (such as the Air Passenger Duty imposed for travel from the United Kingdom) could make Tobago and other Caribbean destinations less attractive for European visitors.⁴

Putting a price on impacts

How much will these climate change impacts cost Tobago's tourism industry? There have been several attempts to quantify the economic cost of climate change on Caribbean tourism. But the impacts are diverse, uncertain, interrelated and highly complex, making it very difficult to provide definitive monetary valuations. Along with the impacts above, some of the

things that make it particularly hard to accurately cost climate impacts include:

Knock-on effects. The impact of climate change on one system often has knock-on effects on related systems that can be very difficult to estimate, particularly for natural systems and the ecosystem services they provide. For example, damage to coral reefs reduces their productivity, attractiveness and ability to sustain biodiversity, which in turn affects the size and numbers of economically valuable game fish further up the food chain, the resilience of the reef and the interest from dive and snorkel visitors. This reduces the quality and value of tourist fishing and diving trips, although the scale of this effect and the time it will take to be felt are uncertain.

Multiple stressors and cumulative impacts.

Climate change is not the only pressure on Tobago's ecosystems — for example, sediment and nutrient run-off from development, waste water management, over-fishing, and mismanagement of and lack of respect for protected areas also adversely affect reef systems by making them less resilient to climate change. Isolating and assessing the impact of climate change among these other environmental stressors is extremely difficult.

A basket of goods. Tobago's tourism 'product' is not a single good but a basket of related goods that are consumed in a bundle. So, for example, the value of natural assets such as beaches, reefs and the forest reserve is realised in the economy through complementary goods such as hotel rooms, diving trips, restaurants and tour guides. And the value of one tourist activity, such as sitting on the beach, is enhanced by the easy access to other activities during a holiday. The complementary and integrated nature of tourism products again makes separating, assessing and valuing the impact of climate change highly challenging.

Relative appeal. How 'attractive' Tobago is to tourists depends, to some extent, on the attributes of competing destinations. Climate change is affecting all these destinations, which could benefit or hinder tourism on Tobago. For example, if competing destinations lose their beaches, then the impact of any loss of beaches in Tobago could be reduced. Assessing the effects of these changing relative differences and tourist preferences is expensive, time-consuming and highly imprecise.

Partial damage. Thousands of economic valuation studies have been conducted on a wide range of habitats and the ecosystem services they provide, in many settings. Environmental economists often study coral reefs. But these studies generally take

Table. Impacts of sea level rise on tourism in the Caribbean Community (CARICOM)

Tourism asset	Effect of sea level rising by 1m	Effect of sea level rising by 2m
Large resorts	At least 149 multi-million dollar tourism resorts damaged or lost	At least 233 multi-million dollar tourism resorts damaged or lost
Beaches	Beach assets lost or greatly degraded at many tourist resorts	Beach assets lost or greatly degraded at most tourist resorts
Airports	Loss or damage to 21 CARICOM airports	Loss or damage to 31 CARICOM airports
Sea turtle nesting sites	Flooding of approximately a third of known nesting beaches	Flooding of approximately half of known nesting beaches

Adapted from Simpson, M. C. et al. 2010. *Quantification and Magnitude of Losses and Damages Resulting from the Impacts of Climate Change: Modelling the transformational impacts and costs of sea level rise in the Caribbean*. United Nations Development Programme, Barbados.

an ‘all or nothing’ approach, estimating the reef’s total value per square metre. This is not particularly useful in answering real-world questions of partial and qualitative, rather than complete, damage — for example, what if the area covered by reefs remains constant but the reefs’ quality declines?

Even if you could account for all the uncertainties and complexities in predicting the magnitude and nature of climate change impacts, ‘converting’ them into dollar denominated numbers requires economic models, which inherently adds another layer of uncertainty to cost estimates. And this approach does not fully account for the impact on communities’ livelihood assets and socioeconomic vulnerabilities.

These models fall short of what is needed in several ways. In particular, they are often ‘static’ — that is, they consider the effects of an isolated change under the conditions of *ceteris paribus*, or ‘all other things being equal’. The problem is that climate change never only impacts on one part of a system but simultaneously affects multiple areas of ecosystems and economies that combine in highly unpredictable ways. A static approach also implicitly assumes that systems and economies will continue, in a broadly similar form, into the future, which is not so useful in considering large-scale changes that threaten to completely alter how a system, such as the society and economy of Tobago, functions.

Producing economic models is as much an art as it is a science, so the methods used and results produced will always be open to criticism and disagreement.

A different approach

Despite these difficulties and uncertainties in using economic models to assign a monetary value to climate change impacts, it remains a dominant form of analysis. Indeed, it is an essential part of the mosaic approach required to comprehensively measure climate change impacts. Policymakers, donors and stakeholders

need robust figures to provide and justify how they use resources and funds, and to galvanise action for mitigation and adaptation. Many people believe that policymakers will not act unless they are presented with the large financial cost of doing nothing.

But can a dollar value on impact really drive appropriate policy? Even if it can convince policymakers and stakeholders that something must be done, it does little to inform possible courses of action. At best, economic valuation of damages indicates the scale of the problem. But it provides little direction on how to respond or what to do about it.

We need a different approach — one that takes account of assets and values and moves beyond static assessments of potential losses towards accounting for climate change on a multi-sectoral and livelihood basis and considering how impacts can be addressed.

If economic analysts want to help policymakers in Tobago, their consideration of climate change in the Caribbean must focus, not only on how much it will cost in damages, but on what can be done to help tourism and other sectors cope with it. This requires us to think about making dynamic systems more resilient to the impacts of climate change. But also, when these cannot be sufficiently lessened, how the systems can adapt to changed environments — be it through hard engineering such as flood defences or through softer approaches including labour market reform, revising hotel operations, or policy reform at the national and destination level. Climate resilience must permeate every level of the system and become integral to governance, long-term strategies and daily operations.

Informing policy

Scale and context in economic assessments are important — for example, the answer for Tobago and other similar islands that depend so heavily on tourism cannot simply be ‘diversify your economy to spread the risk’. Keeping tourism on Tobago viable,

even without climate change, requires it to maintain a certain level of visitor revenue. This is partly because keeping Tobago attractive to tourists involves several 'fixed costs' such as maintaining the airport and other infrastructure. In addition, the value of one hotel or tourist attraction is, to a large part, derived from its proximity to others. Fewer tourism businesses — an inevitable result of diversifying the economy — would reduce this 'network' value.

Economic diversification strategies are also limited by the relatively small size of the workforce, 57 per cent of whom already work in tourism. Even if it were possible, diverting the workforce towards alternative employment would risk producing multiple small sectors, none of a sufficient size to be competitive, especially given the island's high transport costs. Economic diversification can even be 'maladaptation' if it pushes working sectors away from being environmentally and economically sustainable. Economic policymakers in Tobago are forced to pick a sector — tourism — and promote it.

Climate change is a serious threat to island economies in the Caribbean.⁵ But it is too often characterised as a threat to economic numbers rather than a threat to people and communities. Preventing economic losses is not an end in itself. Economies are important because they provide vital services and livelihood assets to people. Climate change assessments and policy

prescriptions should start by considering the services and livelihood assets they are trying to protect and climate policy should be thought of and framed as protecting people rather than protecting GDP or other abstract numbers.

Some traditional economic analysis is useful for informing policy. But, on its own, it is not enough. Imperfections and uncertainty in climate and economic models have regularly been used to justify more detailed, complex and expensive models, which often lead to more disagreement and confusion rather than the promised clarity of policy direction.

The acid test for applied economic research must be its ability to properly inform policy. Economic research should not be performed for the sake of it or due to a lack of imagination for new avenues of investigation. Climate change in the Caribbean is a threat that traditional neo-classical economics cannot fully assess. Caribbean communities must be ready to adapt to climate change. Economic analysis must similarly adapt to better inform policy on how to do that.

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■ ¹ Simpson, M.C. *et al.* 2010. *Quantification and Magnitude of Losses and Damages Resulting from the Impacts of Climate Change: Modelling the Transformational Impacts and Costs of Sea Level Rise in the Caribbean*. United Nations Development Programme (UNDP), Barbados. ■ ² O'Farrell, S., Day, O. 2005. *Report on the 2005 mass coral bleaching event in Tobago*. Buccoo Reef Trust, Tobago. ■ ³ Simpson, M.C. *et al.* 2009. *Modelling the Impacts of Climate Change in the Caribbean with contribution from the Pacific Islands*. UNDP, Barbados. ■ ⁴ Pentelov, L., Scott, D. 2010. The Implications of climate change mitigation policy and oil price volatility for tourism arrivals to the Caribbean. *Journal of Tourism Hospitality and Planning Development* 7(3) 301–315. ■ ⁵ Simpson M.C., Scott, D., Trotz, U. 2011. *Climate Change's Impact on the Caribbean's Ability to Sustain Tourism, Natural Assets, and Livelihoods* Inter-American Development Bank (IDB) Sustainability Report. IDB, Washington DC.